OUTLINES

OF

GENERAL ORTHOPÆDIA

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PREFACE.

The subject of the following pages appeared to the Author, from its novelty and growing importance, to be one of the most suitable he could select for the Dissertation which was required from him by the Medical Faculty of Tübingen, at the close of his examinations in that University. He is not aware of the existence of any concise general account of the present state of Orthopaedic science, although many treatises

have appeared upon detached parts of it. He therefore ventures to hope, that in bringing within a small compass such introductory information on the subject as may tend in some degree to supply this deficiency, he is rendering at least a temporary service to this interesting branch of Medical inquiry.

Tübingen, August 1840.

§. 1.

Preliminary Definitions.

The objects of Orthopaedia are the investigation of the deformities to which the human frame is subject, and the application of efficient methods of prevention and cure. The late Delpech gave the name Orthomorphia to this science; but though more appropriate, it has not been generally adopted.

The diseases which come under the department of Orthopaedia (distortions, contractions etc.) may all be defined as deviations of the limbs or joints from their normal form and position. They are characteristically distinguished from others of a similar appearance (fractures, dislocations etc.) by their being unaccompanied with pain, generally slow in their development, and very seldom occasioned by external violence or wound.

The seat of orthopaedic diseases is in the bones, cartilages, ligaments, or muscles, — in a word,

in the articular system. Since these organs of motion determine the form of the body, and are consequently subject to mechanical laws, it is obvious that orthopaedic diseases are to be considered as derangements of an organic mechanism.

It is important, before we proceed further, to point out several deformities, bearing in many respects a striking resemblance to orthopaedic diseases, yet essentially different from them.

Changes in the form of bones after fractures, which, during the process of an imperfect healing, have assumed a crooked shape.

Deformities of bones appearing as the secondary symptoms of an organic disease of these parts; for instance, Spina Ventosa, Exostosis.

Inveterate dislocations. These, though occasionally treated in orthopaedic institutions, belong evidently to another department.

Lastly, Anchylosis, when the consequence of arthritis or arthrocacia, must also be excluded from the number of strictly orthopaedic diseases.

§. 2.

Classification of orthopaedic Diseases.

One class of orthopaedic diseases is characterised by an alteration of the natural form through the whole extent, or *continuity*, of the bone.

To this belong Curvatura (sensu strictiori). It occurs in the cylindrical bones of the extremities, in the Ribs, and Sternum.

The other, and by far the more extensive class, comprises all the diseases in which the bones are affected only at their *contiguity*, of which a wrong direction of the joints is the consequence.

As subspecies we may here mention:

a) *Loxarthrosis*, particularly that form of articulation called ginglymus.

b) *Anchylosis*, or that stiffness of the joint in which the power of motion is partially or entirely lost.

It is necessary nevertheless to observe, that, in many cases of actual practice, the deformities of both these classes are so variously combined as to render a correct diagnosis extremely difficult.

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§. 3.

Enumeration of orthopaedic Diseases.

In enumerating orthopaedic diseases we shall adopt an anatomical order.

I. Orthopaedic diseases of the Spine.

Under these we notice,

A. Distortions of the cervical Vertebrae (cephalonia).

Curvatura colli — caput obstipum — cervix obstipa — Torticollis (Wryneck, der schiefe Hals).

1) Obstipitas colli admuens (abnormal inclination of the Head forwards) Trachelocyrtosis.

2) The abnormal inclination of the Head backwards (obstipitas colli remuens, anchenocyrtosis).

3) The abnormal inclination of the Head sidewards (obstipitas colli lateralis — caput obstipum, sensu strictiori — Trachelocyllosis,

4) Distortion of the neck — (Torticollis, sensu strictiori — Trachelostrophosis — obstipitas colli distorta.)

B. Curvatures of the Dorsal Vertebrae.

5) Distortions of the Vertebral column (spondylostrophosis).

6) Hump-back; Hunch-back. Some of the Thoracic Vertebrae angularly protuberating. (Cyphosis maligna — Cyrtosis — Cyphosis paralytica — Gibbositas).

7) The Round Back — The circular distortion of the Thoracic Vertebrae backwards. (Cyphosis benigna — Cyphosis senilis.)

8) The lateral distortions of the Vertebrae (Scoliosis — Cyllosis — Curvatura Lateralis — der Seiten-Buckel).

C. Curvatures of the Lumbar Vertebrae.

9) Inclination of the Lumbar Vertebrae sidewards (Lordosis, Divaricatio).

II. Orthopaedic diseases of the Thorax.

10) High Breast or Pigeon-Breast (Pectus Elatum — Thoracocyrtosis — die hohe Brust — die Vogel-Brust).

11) The Depression of the Sternum (Pectus carinatum).

12) Distortions and displacements of the chest in varions ways (curvatnrae costarum — Thoracocyllosis).

III. Orthopaedic diseases of the upper Extremities. (*Curvaturae extremitatum superiorum.*)

13) The High shonlder. (Humerus Elatus — Omoplaticyllosis.)

14) Curvatnres and displacement of the Clavicula. (Cnrvaturae claviculae.)

15) Contractions and anchylosis of the articnlation of the Humerus (contracturae et anchylosis articulationis Hnmeri).

16) Curvatures of the Humerus (curvaturae Hnmeri).

17) Contractnres of the anti-Brachial Bones (contracturae antibrachii — Olenocampsis).

18) Curvatures of the Ulna and Radius.

19) Contractures of the Hand (contractnrae manus — Chirogryposis — Talipomannus flexa — der Klump hand — knoll hand).

20) Talipomanus extensa.

21) Contractures of the Fingers (contractnrae digi-

torum manus - Retractio digitorum - Uncatio Digitorum - Dactylogryphosis).

IV. Orthopaedic diseases of the lower extremities. (*Curvaturae extremitatum inferiorum.*)

A. Curvatures of the Pelvis. (Curvaturae pelvis.)

22) Abnormal inclination of the Pelvis (Pelvis male inclinata).

23) The sidewards - distorted pelvis - (Coxa elata - Ischioscambosis).

24) Contraction of the Femur towards the abdomen (Contracturae coxae — Contractura Flexorum femoris).

25) Congenital dislocation of the Femur (Luxatio congenita femoris — claudicatio congenita).

26) Contraction of the extensors of the Femoris - (Malum coxae senile — contractura extensorum femoris).

27) Anchylosis Femoris.

28) Curvatures of the Femur. (Curvaturae ossis Femoris.)

29) The curvature of the knee inwards (genu Valgum).

30) The Bending of the knee outwards (genu Varum — Exogonyancon).

31) The Bending of the knee forwards. (Contractura Flexorum cruris — Emprosthogonyancon.)

32) The curvature of the knee backwards (genu Recurvatum — Opisthogonyancon).

33) Distortion of the articulation of the knee (Gonystrophosis).

34) *Ancylosis* of the knee-joint.

35) The horse-foot (Pes equinus — Hippopodia — Oxypodia, der Pferde-Fuss).

36) Talus — Valgus primitivus.

37) The club-Foot (Talipes Varus — Curvatio vara).

38) Talipes Valgus (the Flat-foot — Platipodia).

39) The wide Foot.

40) Curvatures of the Toes. (Curvaturae digitorum pedis.)

§. 4.

Historical progress of the Science of orthopaedia.

Although the deformities above enumerated were too obvious and striking not to force themselves on the observation of Physicians in former times, it is surprising that, while such considerable advances were made in other branches of medical science, the interesting inquiries of orthopaedia were entirely neglected, and that, till within a recent period, the greatest ignorance as to the Aetiology and treatment of its diseases universally prevailed. So tardy were the medical world in acknowledging its claims, that, even so late as the middle of the last century, there had not appeared a single treatise in which the subject was handled in a rational and systematic manner.

Meanwhile Empiricism, which was then at its height, found ample scope in this hitherto unoccupied field of science for the undisturbed exercise of its pernicious influence.

It was not till the close of the century that the investigation of orthopaedic diseases was ta-

ken up by more competent hands. The works of Venel, Sheldrake, le Vacher de la Fentrie, Brückner, Glisson, D. Van Gesscher, Portal now appeared. Although very partial and unsatisfactory, they have the merit of containing the first approximations to enlightened views [1]). But the monograph of Joerg, published in 1806, far surpassed its predecessors in the soundness and extent of its investigations, and contributed essentially to elevate Orthopaedia

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1) Venel, description de plusieurs nouveaux moyens mécaniques propres à prévenir, et même corriger dans certains cas les courbures laterales et la torsion de l'epine du dos. Lausanne, 1788.

F. Sheldrake, Essay on the various causes and effects of the distorted spine and on the improper methods usually practised to remove the distortion. London 1783.

Le Vacher de la Feutric. Traité du Rachitis; où, l'art de redres sur les enfans contrefaits. Paris 1772.

Brückner, über die Natur, Ursachen und Behandlung der einwärts gekrümmten Füsse.

D. Van Gesscher. Bemerkungen über die Entstellungen des Rückgrathes und über die Behandlung der Verrenkungen und Brüche des Schenkelbeines. Aus dem Holländischen von J. C. Weweyer. Göttingen 1794.

Portal, observations sur la nature et le traitement du Rachitisme ou du courbure de la colonne vertébrale et de celle des extrémités. Paris 1797.

to the rank of a science [2]). From this period we may date the rapid progress of this now widely cultivated branch of medical inquiry. Many orthopaedic institutions have been founded, since that time, on the continent. The first of these was that of Heine, in Wurzburg in, 1812. — The most satisfactory results have attended the curative measures of this and similar institutions to which it has served as a model [3]). We also now possess

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2) Joerg, über die Verkrümmungen. Derselbe über Klumpfüsse und eine leichte und zweckmässige Heilung derselben. Mit 3 Kupf. Leipz. und Marburg 1806.

3) Among these, the orthopaedic institution at Cannstadt, near Stuttgardt, under the superintendence of Dr. Heine, deserves especial notice. It was founded, principally at government expense, in the year 1829, and is on a very extensive scale. Not only are the latest and best improvements of the orthopaedic art (many of which are Dr. H's. own invention) brought into full operation in this establishment, but it possesses peculiar local advantages in the beauty and salubrity of the situation, and the valuable chalybeate waters of the neighbourhood. — These waters are here also rendered available for bathing purposes by admirably constructed baths. This institution has been very successful from the first in the treatment of disease. The most serious deformities have been in numerous instances removed by the application of mechanical means alone. Per-

some very valuable works on orthopaedic diseases [4]).

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fect cures have been effected in various obstinate cases of Paralysis of the extremities in children, and in one remarkable instance of *coxarthrocace* without having recourse to the moxa. But it would be unnecessary in this place to enter into further particulars, especially as this institution is now so well known to the medical world.

4) Delpech, considérations anatomico-médicales sur l'art appelé orthopédie, et sur les difformités qui en sont l'objet. Revue medicale, 1827 Jan. et Juin.

Dufour, mémoire sur l'art de prévenir et de corriger les difformités du corps désigné sous le nom d'orthopaedie in Revue medicale. 1827.

Ward, practical observations on distortions of the spine, chest and limbs. London 1822.

F. W. Heidenreich, Orthopaedie, oder Werth der Mechanik zur Heilung der Verkrümmungen am menschlichen Leibe. Berlin 1827.

J. Shaw, distortions of the spine and chest. London 1825.

C. Wenzel, über die Krankheiten am Rückgrathe, mit 8 Kupfertafeln. Bamberg 1824.

Mémoire sur la cure radicale des pieds bots par M. Scoutetten avec six planches. Paris Baillère 1838.

Stromeyer, Beiträge zur operativen Orthopädik oder Erfahrungen über die subcutane Durchschneidung verkürzter Muskeln und deren Sehnen. Hannover 1838.

A lecture on Loxarthrus or club Foot: by Th. Mutter etc., Philadelphia, Hooker and Claxton 1839.

§. 5.

Diagnosis.

There is little or no difficulty in the Diagnosis of orthopaedic diseases. Even without availing our-

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Mémoire sur les différentes variétés anatomiques du pied Bot congénital, dans leurs rapports avec la retraction musculaire convulsive, présenté à l'académie etc. par Jules Guérin. Paris, Bureau de la gazette medicale 1839.

Mémoire sur la section du tendon d'achille dans le traitement des pied bots, par Bouvier. Paris, Baillière 1839.

Traité pratique du pied bot par Vinc. Duval. M. D. Direct. des traitemens orthopéd. Paris, Bailliére 1839.

A treatise on the nature of club foot and analogous distortions, including their treatment etc., illustrated by cases. By W. J. Little, M. D. London 1839.

A lecture on the nature, treatment and cure of club foot, illustr. by cases. By M. Stapleton, Dublin 1839.

Cure of wryneck, bent knee and club foot, spinal and other deformities. With remarks etc. by Gust. Krauss M. D. London, Churchill 1839.

Mémoire sur une nouvelle méthode du traitement du torticollis ancien, présenté à l'acad. etc. par Jules Guérin. Paris 1838.

Mémoire sur les moyens de distinguer les déviations simulées de la colonne vertébrale des déviations pathologiques, prés. à l'acad. par J. Guérin.

Mémoire sur les caractères generaux du Rachitisme, la à l'acad. Royale par M. le Dr. J. Guérin. Paris 1839.

Beobachtungen über Lähmungszustände der untern Ex-

selves of the evidence furnished by the distinctive characteristics of orthopaedic complaints previously mentioned, we shall find, in the majority of cases, that a mere ocular inspection of the naked frame is sufficient of itself to detect an orthopaedic disease, and guide us in our Diagnosis. — Not so easy is it, however, satisfactorily to determine the aetiology of deformities, and the degree in which the surrounding organs participate therein.

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§. 6.

Aetiology.

Most of the curvatures are either congenital, or take place during the development of the limbs before the age of puberty. Accordingly the greater majority of patients consist of children. We begin with the more strictly congenital cases. — The causes of these deformities may be brought under the following classification.

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tremitäten und deren Behandlung von J. Heine, Dr. Med. et Chirurg., Gründer und Vorsteher der orthopädischen Heilanstalt zu Cannstadt a. N. Mit 7 Steindrucktafeln. Stuttgart 1840.

1. The situation of the foetus in the uterus is a predisposing cause of contractions; for in this situation it is evident that the Flexor muscles preponderate over the Extensors.

An imperfect structure of the osseous and articular systems may also be considered as a cause of congenital curvatures; as, for instance, the congenital luxation of the femur, Pectus carinatum, etc.

2. There is an hereditary peculiarity in the organisation of the limbs, in which the slightest cause is capable of disturbing their normal development, and thus occasioning curvatures. This peculiarity generally consists in a certain tenderness of the osseous system, together with a laxity of the muscles; a frequent consequence is the interruption of the normal formation of the spinal curve. This congenital constitution of the limbs, approaching very much to a scrofulous softness of the bones, is principally confined to the female sex. It becomes evident at the age of puberty, the patient in all other respects apparently eujoying a healthy constitution. No doubt the curvatures which are common in old age, together with the atrophy of the heads of bones, and the entire consumption of

the cartilages between the joints, in that period of life, are the effects of this peculiar state of the limbs.

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§. 7.

3. The consistence of the osseous substance and the strength of the muscles, though differing in degree according to age, sex, and individuality, ought in every case to be proportionate to one another. On this principle depends the preservation of the normal form of the human frame. The first and most interesting case in which this principle is violated, is in the disease Rachitis, which, according to the observation of all Physicians, is usually followed by a permanent mollities of the internal structure of the bones. It is a disease of early life, generally commencing, or at least first observed, when the infant should make its earliest attempts to walk, and rarely appearing after the age of two years. It would appear, from the statements of modern Pathologists, that Rachitis is not merely confined to the osseous system, but that it is connected with an inadequate nutrition of the whole organisation. However correct that opinion may be, it is unquestionably in the osseous system

alone that its effects are obviously marked. All the bones of the skeleton are more or less affected, although particular local causes produce much greater deformity in some parts than in others [5]). — The Chest suffers very much in this respect, — either in the ribs, in the spine, or in both; and the compressed or contracted Thorax, or laterally curved spine, are the results. But of all the parts that are affected in Rachitis, the pelvis is that which is most liable to distortion. The reason is obvious: it sustains the weight of the principal parts of the body, is the centre of various and contrary motions, and is subjected to irregular and unequal pressure. — Hence result the strangest and most complicated deformities. It is scarcely necessary to remark that pregnancy in such circumstances is highly dangerous, since the most hazardous obstetrical operations are unavoidable [6]). — A much less

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5) See Pathological conditions of the bone, by W. H. Porter, in the Cyclopaedia of Anatomy and Physiology, edited by R. Todd, M. D. Vol. 1. London 1836.

6) P. Camper, demonstrationes anatom. patholog. lib. II. continens pelvis humanae fabricam et morbos. Amstelod. 1760. 1762.

frequent cause of deformity is a scrofulous state of the constitution.

In the years of manhood there exists sometimes a certain softness and flexibility of the bones, causing them to bend in every direction, and necessarily rendering them useless for the purposes of support or motion. This disease is termed Osteomalacia, and is a frequent cause of curvatures [7]). Nothing is certainly known of the origin of this curious disease, and there is a great deficiency in this branch of Pathological knowledge. It is so rare an affection, that little opportunity for anatomical or chemical examination has occurred. But

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Fremery N. C. Diss. de mutationibus figurae pelvis praesertim iis, quae ex ossium emollitione oriuntur. Lugd. Bat. 1793.

Cohn. S. D. De varia pelv. faem. forma. Regiom. 1827.

Kilian, Herm. Fr. Beiträge zu einer genaueren Kenntniss der allgemeinen Knochenerweichung der Frauen und Ihres Einflusses auf das Becken. Bonn 1829.

Delpech, Atlas de l'orthomorphie par rapport à l'espèce humaine (Bassin de Rachitique singulièrement difformé pl. XXX. III. p. 62.).

Choulant T. I. Decas. I und II. Pelvium spinarum que deformatarum adjectis nonnullis annot. Lips. 1818—1820.

7) Eckmann, Diss. descriptionem et casus aliquot osteomalaciae sistens. 1790.

the dissections that have been made exhibit such a decided alteration of structure, as to justify the opinion of those who attribute it to a malignant disposition in the entire system [8]). — Scorbutic and syphilitic diseases, when they have been of long duration, produce a mollification of the bones presenting all the phenomena of Osteomalacia. And, if we may trust the observations of the most eminent medical men, a protracted mercurial treatment alone is capable of affecting the osseous system to a no less pernicious extent.

§. 8.

4. This will be the proper place to mention as a more immediate, and at the same time far more frequent, cause of deformities of the human frame, the preoccurrence of diseases of the joints. These, under unfavorable circumstances, terminate often in permanent orthomorphic disorders.

8) Broomfield. Surgery Vol. III.
Dr. Schönlein's Pathologie und Therapie. Dritter Theil. pag. 63.

Swellings of the joints in a scrofulous or arthritic constitution give rise to derangements in the surface of articulations which lead to contortions and displacements of the heads of bones. Inflammation of the synovial membrane, hypertrophy and atrophy of the cartilages of the diarthrodial and synarthrodial articulations (as for instance the intervertebral cartilages), occasion curvatures of greater or less consequence. — That species of ancylosis which, on account of a preponderance of the Flexor muscles over the Extensors, gives a crooked appearance to the limb, originates more frequently in the cause just mentioned than in any other.

5. It cannot be denied that mechanical causes are apt to produce malformations in constitutions otherwise free from disorder: especially when a predisposition exists. A very common instance is a neglectful treatment in luxations. In all cases where the dislocated part has not been successfully reduced, a crookedness, not only of the joint itself, but of the neighbouring articulations, ensues. Club-Foot has been known to be the consequence of a wound in the sole of the foot. Innumerable cases of curvatures of the bones of the chest have

originated in the improper use of stays [9]). But amongst the mechanical causes of deformities, none have produced more striking cases than a continued unnatural position of the body; as in those occupations where there is an unequal exertion of the limbs. A long-continued pressure in any one part of the system causes a paralysis of the muscles of that part, whilst the antagonist muscles become disproportionately strong. Hence the principle, upon which the normal form of the body depends, becomes disturbed, and the most complicated curvatures are thus occasioned.

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§. 9.

6. Finally, we observe that orthopaedic diseases have sometimes their seat merely in the muscles, tendons, and tendinous aponeurosis. This is the case:

I.) When an abnormal excess of motion prevails in one set of muscles, whilst the autagonists are only exercised in their usual degree. This most

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9) S. T. Sömerring über die Schädlichkeiten der Schnürbrüste. Berlin 1793.

frequently happens to the Flexors, which are normally stronger than the Extensors, owing to their fibres being more numerous, and to their being inserted further from the centre of motion. Now, a partial exercise, — a chronic, rheumatic, or arthritic affection, — or an inflammation of these muscles, may produce an unusual contraction in them; and a permanent shortness is the consequence.

II.) This is also the case in complicated wounds. A loss of substance occasions alteration of the muscle. Again, a mere inflammation of a muscle often terminates in a thickness of the cellular tissue; the sheaths of the tendons become hardened, or the muscles adhere to the skin that covers them.

III.) On the other hand, an abnormal defect of muscular action, arising from an inadequate degree of nervous energy, is another striking cause of malformation of limbs. For example, a chronic inflammation of the brain or spinal chord frequently diminishes the energy of the muscular system, and thus ultimately produces deformities.

§. 10.

We may now arrange the causes of Orthomorphic diseases above enumerated, under the five following heads.

1. Mechanical. (Curvatura traumatica, sive habitualis.)

2. Morbid condition of the osseous system. (Curvatura ossaria).

3. Derangement of the articulations. (Curvatura articularis.)

4. Interruption of the normal equilibrium of muscles. (Curvatura muscularis.)

5. Defect of nervous energy. (Curvatura nervosa.)

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§. 11.

Prognosis.

Orthopaedic diseases are of more frequent occurrence within late years than formerly. It is also a well ascertained fact that they prevail most in the higher classes of society. From these two circumstances, we are led to coincide with the opinion, which has been unanimously adopted by the

most able writers on the subject, that the more general introduction of luxurious and artificial habits has been mainly instrumental in producing so marked an increase of orthopaedic diseases in the present day [10]).

In general, orthopaedic diseases present a very unfavorable prognosis. As this prognosis, however, must ever vary according to the degree in which the general constitution is affected, we shall premise a few observations, with a view to show how far this is the case in certain particular instances.

1. Deformities of the human frame obviously exercise, in a greater or less degree, a prejudicial influence on the social enjoyments of life.

2. The higher degrees of compressed or contracted Thorax lay the foundation for a variety of diseases of the thoracic and abdominal viscera, by interrupting the functions of the most important central organs of life. Under these circumstances, the heart and the greater vessels connected with

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10) See J. M. Good's Study of Medicine. Vol. IV. p. 528—550. Dr. Dodd's Pathological observations on the contorted spine. London 1824.

it, the lungs, the nerves of the spinal cord, and the organs of digestion, must necessarily suffer in proportion to the extent of the evil. In the worst cases, the constitution speedily sinks under a complication of diseases, and the patient is hurried to a premature grave; or, should his life be prolonged, it is scarcely possible for him to escape the subsequent attack of Apoplexy or Dropsy in an aggravated form.

3. We have already noticed that deformities of the Pelvis are accompanied with the most lamentable consequences in the instance of pregnant females. The further consideration of such cases belongs to the obstetrical art. The late founder of the orthomorphic institution at Montpellier, Delpech [11]), has described some remarkable cases of this deformity, in which the application of orthopaedic means was attended with very partial results.

4. In some cases the limbs are so deformed that they become burdensome and useless to the

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11) Delpech, atlas de l'orthomorphie, par rapport à l'espèce humaine.

patient; exercise is rendered impossible, and the constitution is gradually undermined.

5. When an ulcerative process of the bones (Caries) or Tuberculosis accompanies Curvatures, the patient almost invariably falls a victim to this double interruption of the vital functions.

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§. 12.

Having made these preliminary observations on the prognosis of malformations, as far as the general health is secondarily affected by them, we shall now proceed to the prognosis of the diseases themselves in the following order.

1. We may fix the twentieth year for the latest period in which a perfect cure may, in the average of instances, be expected. The probability of speedy and complete restoration, however, is greater in proportion as the patient is young, and the duration of the deformity short. If the disease be taken at the commencement, the main difficulty is removed; and in such cases the most favorable prognosis may be confidently given. But if the age of the patient be advanced, and the deformity

(especially if of a malignant kind) inveterate, there is but faint hope of even partial amendment.

2. Females, while they are more liable from the delicacy of their frame to deformities than the male sex, are yet, (from the same cause, in connexion with other physiological peculiarities,) far more favorable subjects for orthopaedic treatment than the latter.

3. Curvatures proceeding from mechanical causes (Curv. habitualis), if the patient be under the age of manhood, and the constitution be not impaired, are readily cured under proper inspection, as soon as the detrimental influence has been removed.

4. So long, however, as a cachectic disease of the bones (such as Scrofula, Rachitis, and Osteomalacia) is present, the prognosis must be regulated primarily by the considerations of general medicine, and only subordinately by those of orthopaedia.

5. The deformities which originate in contractions and shortness of the muscles, ligaments, or tendons (curv. muscularis), offer a very favorable prognosis, when the affected organ is sufficiently

near the surface to be accessible to the treatment which the case demands.

6. Far less favorable is the prognosis of the curvatures of bones arising from a morbid condition of the osseous structure (curv. ossaria). The means for reducing abnormal deviation of bones or articulations to their normal form are very limited. In cases of Ancylosis or inveterate Scoliosis, or when the joint is under a process of ulceration, (arthrocacia) or, finally, when the bones, under the influence of constant pressure, have become atrophic, — there can be but little hope of effecting a radical cure.

We conclude this section with remarking that a firm, but not violent, course of treatment, administered with unremitting attention and kindness to the patient, is indispensably requisite in all orthopaedic cases. No favorable prognosis can be made, where these essential points are not first secured.

§. 13.

Therapeutics.

The physician must, in the first place, examine minutely into the kind of deformity before him; and endeavour to determine as precisely as possible the Aetiology of the case. If the causes still exist, an immediate removal of them must be attempted. Our first indication is therefore:

I. *The indicatio causalis.* If there be an inclination to deformity, prophylactic means must be resorted to.

(Prophylaxis). We have observed that a strong inclination to deformity often exists at the age of puberty, in both sexes, but particularly in the female. A too rapid growth of the body occasions a general weakness. The spine is in most cases particularly affected. The limbs become less capable of sustaining the weight of the body, and scrofulous and arthritic symptoms often make their appearance. Under these circumstances the slightest exciting causes are capable of interrupting the normal formation of the body: and here, therefore, our prophylactic measures must obviously be a

strengthening and tonic course of medicine, diet and exercise.

1. It will be observed that there is in these patients a sluggishness and torpitude of the intestinal canal, with a feebleness of peristaltic motion; and that Helminthiasis is a complaint by no means uncommon. Here active purgatives and anthelmintics (Semen cynae, the rectified oil of Turpentine etc.) should be administered. We must afterwards invigorate the digestive organs with general tonics: as Rhubarb, Calmus, the preparations of iron (particularly the Tinctures), and cold water as a morning beverage. As, however, an habitual costiveness generally follows the use of internal tonics, cool aperients must be given from time to time.

2. In connexion with this, a due regard must be paid to the diet and regimen of the patient. The diet should be generous, consisting of animal food, at once substantial and easy of digestion, and of such vegetable nutriment as is least likely to ferment in the stomach. Great regularity must be observed in the times of taking meals.

3. Proper attention to the skin is of no less importance. We must increase and invigorate its

action, with warm and cold bathing, general friction, and suitable clothing.

4. A warm and dry atmosphere, and fresh country air, will invigorate the organs of respiration.

5. The mind should be regularly occupied with some agreeable kind of intellectual labour.

6. The necessity of the patient's sleeping upon an incompressible mattrass is obvious; since the existing inclination to curvature would be materially favoured by the use of a bed giving way to the pressure of the body. It is also advisable that the bed should be somewhat inclined. The patient should also after exercise repose upon an inclined plane.

7. But of all prophylactic means, the most efficacious, when under judicious direction, are the various gymnastic exercises. These must however be duly proportioned to the strength of the patient; for over-exertion here would be attended with directly opposite effects.

There is no doubt that if the measures above recommended be persevered in with regularity and judgment, they will be followed with the most advantageous results. For fully securing this object,

it is indispensable that the patient should be removed to an Orthopaedic Institution. It must be evident that no private arrangements can, even under the most favorable circumstances, be an adequate substitute for the advantages a well conducted institution affords.

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§. 14.

When orthopaedic diseases have been occasioned by Mollities — either through Rachitis, Osteomalacia, Scrofula, or caries of the bone — and the causes of these derangements of the osseous system still exist, it is manifest that medical treatment must first be resorted to. On this we will merely remark, that the system must be generally strengthened by a fine, dry, and temperate atmosphere, combined with a wholesome and somewhat generous diet. Cold bathing and regular exercise are of much importance. A tonic plan of medicine will effectually cooperate with this tonic regimen. The bowels must be kept open with Rhubarb or neutral salts: and a further intention must be to produce a direct supply of osseous matter.

An orthopaedic treatment may be very advantageously combined with this medical one. The principal thing is to apply the various kinds of apparatus, which have been invented for giving support to the limbs that seem generally to suffer, and for removing the weight of the body from one part to the other. The best mechanical instruments are, — a hard mattrass, not giving way to pressure, and so contrived as to be easily carried about in the open air, and a hard floor, on which the patient may lie at full length, and stretch his limbs as he pleases [12]). In infancy, however, that mode of treatment is generally found unsuitable. When disease pervades the entire system, the instruments may be productive of more harm than good; as one part of the body will be aided at the expense of the other.

II. *The second indication* is to restore the limbs to their normal form. For this object the science of Orthopaedia possesses a variety of means, on the judicious choice of which the success of the treatment depends.

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11) See J. M. Good's Study of Medicine. Vol. IV. p. 343.

Where there is a general debility and emaciation of the frame, where the energy of the nervous system upon the muscles is much diminished, and where the general economy of the circulation is interrupted, the employment of *dynamic* means is found of decided service. Our intention must be, in the first instance, to invigorate the diseased muscles, and re-excite irritability in their fibres.

1. And first, by *manipulations*. These consist in a series of Frictions, systematically performed: also in squeezing and striking the muscles. The effect is an increased activity of the capillary vessels, by which stiffness is alleviated, and the contracted part rendered supple. Spasms and chronic Rheumatism are thus removed. These manipulations must be performed while the patient is bathing; and the general effect will be increased by the use of oily embrocations at two other periods of the day, which should be rubbed in for half an hour at a time. Of course, this method of treatment must be modified according to the constitution of the patient, and the stage of his illness: and it need scarcely be mentioned, that when inflammatory symptoms accompany diseases of the joints it is

contra-indicated. These manipulations were first introduced by Dr. Balfour; and it would appear, from the observations we have been able to collect, that considerable advantages have uniformly attended them.

2. *Gymnastics.* The beneficial results which have followed the use of gymnastics in orthopaedic institutions leave no doubt as to their efficacy. Much, however, is still wanting in this department. Though many of the most ingenious contrivances have been already introduced in Dr. Heine's and other institutions; the object seems scarcely attained till every deformity has its appropriate species of remedial exercise.

It is important that repose should follow each exercise. The patient should lie down on an inclined plane, keeping the body somewhat on the stretch. In all kinds of lateral distortion of the spine, this position affords most ease.

3. A third means of exciting irritability in the enfeebled muscles, is the use of long repeated *frictions* with flannel steeped in vinegar, or with liniments, as Linimentum Ammoniae, Camphorae comp., Terebenthinae, or with Sp. Rosm., Sp. La-

vendulae compositae etc. Cold affusions; cold bathing; and when a scrofulous diathesis is manifest, sea bathing; shower baths, vapour baths etc., are also to be prescribed. Much, however, depends upon regularity in the application of these means.

Electricity, immediately after manipulation and friction, is an equally powerful method of exciting irritability in the muscular fibres.

It is usually applied twice a day, from five to ten minutes each time.

The treatment to be pursued in cases of contraction of the limbs, originating from the preponderance of one set of muscles over the antagonists, from clonic spasms, Rheumatic affections etc., should consist, as in the former case, in manipulation and gymnastic exercise, modified however according to particular circumstances. But our principal intention here must be to subdue the contractile power of the muscles by softening their fibres. This we can effect by the application of Emollients; by the use of baths in which the temperature of the water is uniform; as at Wildbad, in the Black Forest, which is particularly excellent in this respect. If

a decoction of Althea or Malva be mixed with the bath, the emollient effect is much improved. Local vapour baths and fomentations are also of much service.

Counter-irritation is often resorted to in many orthopaedic diseases. In cases of distortion of the spine, and palsy of the lower limbs, Rubefacients have been found beneficial, — the Emplast. Cantharidum, and embrocations of Ung. e Tart. Emet. — The blister should first be applied to the spinal processes; but afterwards to the whole length of the spine. Many practitioners have been in the habit of burning moxa, or cotton alone, for the cure of distortions of the spine. Dupuytreyn employed the former, Pascal the latter: both with advantage [12]). They applied the moxas in pairs, beginning with the tenth and eleventh vertebrae. Dr. Pott [13]) found the use of caustics on each side of the spine peculiarly serviceable; and they have since been brought into frequent use.

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12) Recueil de mémoires de chirurgie. Paris 1821.

13) Remarks on that kind of palsy of the lower limbs which is frequently accompanied with curvatures of the spine. By Percival Pott. London 1719.

§. 15.

We now come to the consideration of Mechanic means in general. Orthopaedic *bandages* are only applicable to very simple cases, and are generally used in combination with mechanic *apparatus*. Köler's and Brückner's bandages are most commonly in use.

There are various kinds of mechanic apparatus: but they are all modifications of three principal ones: viz. apparatus of *compression*, of *extension*, of *support*. The apparatus of compression most in use are those of Jörg and Schmid. To the apparatus of extension belong the stretch-beds of Shaw, Heine, Maissonnabe; Lafond's fauteuil extenseur; Duverney's and Camper's extension machines; Stromeyer's and Scarpa's foot-board, for club foot. Those of support are chiefly the inventions of Delacroix, Glisson and Zimmerman. —

The description of these apparatus belongs to special Orthopaedia. In the application of them much caution is required; they should be as elastic as possible, so as not to create pain or inconvenience to the patient. It is important, too, that their effects should be produced gradually. A care

ful inspection of them should frequently be made: since, independent of the repairs which become necessary, they must, from time to time, be modified according to the stage and progress of the deformity. This requires an experienced eye and unremitting attention; if omitted, or done negligently, unfavorable consequences will certainly ensue.

§. 16.

Orthopaedic Operations.

Myotomy and Tenotomy.

The division of muscles and tendons, in the treatment of deformities, was unknown to the ancient school of medicine.

In the 17th century, several cases of Torticollis having been effectually cured in Holland and Germany by dividing the Sterno-cleido-mastoidens; the idea was suggested that contractions of the limbs might possibly be cured by division of the tendons. Thilenius of Frankfurt, was the first Physician who proposed, in 1784, the operation of Tenotomy. His patient was a young lady, seventeen years old, who from her earliest infancy had been affected with Talipes Varus of the left foot. Being no operator himself, Thilenius applied to a surgeon of the name of Lorenzo, who performed the operation with success. In his description of

the case [14]), Thilenius relates that, as soon as the tendon was divided, the heel descended about two inches, rendering the patient capable of treading on the sole itself; and that the subsequent treatment was attended with so much success, that, about six weeks afterwards, when the cicatrization was complete, the patient was able to walk as well as the soundest person. The example of Thilenius was followed, in 1809, by Sartorius, who operated on a boy, aged 13, suffering under Pes Equinus. He was successful as far as the operation itself was concerned; but his subsequent mode of treatment (as he himself very candidly acknowledges) [15]), was so violent, in his endeavour to restore the foot to its normal form immediately after the operation, that an inflammation of the joints ensued, producing Ancylosis. Nevertheless, the boy was ultimately able to walk without inconvenience. Some years after this, Michaëlis, professor at the University of Wurzburg, performed the

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14) Medicinische und chirurgische Bemerkungen von Moritz Ghérard Thilenius, M. D. Frankfurt a. M. 1789, p. 355.

15) See Siebold's Sammlung seltener chirurg. Beobachtungen. Band III, 258.

operation of Tenotomy on nine patients, some of whom were afflicted with Varus and Pes equinus, others with contractures. He modified the operation so far, as not to divide the whole tendon, but merely one third of its thickness. He states that three weeks elapsed before cicatrization took place. This delay was evidently caused by his having endeavoured to restore the limb to its natural form, too soon after the operation; for in doing so he must necessarily have ruptured the fibres which he had not cut, and thus caused violent inflammation. In 1820, Delpech divided the tendo Achilles of a boy, nine years old. The case was Pes equinus. The cure however was very protracted: which was attributed by the operator to a general derangement in the health of the patient, but probably originated from a too early application of mechanical apparatus. It would appear, however, that a permanent cure was effected. Delpech laid down some general rules with regard to the operation of Tenotomy and its subsequent treatment. The first are valuable, but the latter are materially defective.

Stromeyer of Hanover, now professor in Erlangen, published a work, in 1835, on orthopaedic

operations. He has corrected the errors of Delpech, and has established the operation of division of the Tendons on a sure and permanent footing. In England this new mode of curing deformities was first introduced by M. Whipple of Plymouth, in 1836. He was followed by Dr. Little, lecturer at the medical school of the London hospital, who has written an able treatise on club foot and analogous distortions, and has been a successful operator in numerous cases [16]).

The operation of dividing the tendo Achilles is as follows: The position of the patient is either sitting or recumbent, the operator in this respect suiting his dexterity and convenience. One assistant supports the knee, whilst another extends the foot so that the tendon may somewhat project. The operator, after feeling the tendon with the left fore finger and thumb, effects a puncture in the skin with a small bistoury, sharply pointed and somewhat curved: he then passes his instrument

16) In this work the Author gives an interesting account of his own obligations to orthopaedia; having been himself completely cured of Talipes Varus of the left foot by the skill of Dr. Stromeyer.

through the skin about two finger's breadth above the malleolus internus; directing one edge of it towards the tendon, the other towards the lower muscles, tibial vessels, and nerves. The operator, having ascertained that the knife has reached the skin of the opposite side; turns it so that the cutting edge faces the anterior surface of the tendon. He then divides the tendon in a transverse direction, with one stroke, without wounding the skin which covers it. A snapping sound accompanies the division. Very little blood is effused, and in less than a minute the operation is over.

This is the Stromeyerian method of dividing the tendo Achilles, and is applicable to all others. The general rule in Tenotomy of all muscles is to avoid cutting too deeply, and to divide the tendon from within outwards, in order not to wound the surrounding organs.

During my medical studies in this University, various cases of Pes equinus and Varus have come under my observation, and I have had several opportunities of assisting at the operations of Tenotomy which were performed with uniform success by Dr. Riecke, Professor of Surgery. It would

appear that the form of the knife is of very little consequence, if the operator be dexterous. I have seen the common scalpel made use of with the same advantage as the curved bistoury. After the operation the wound must be cleansed of the effused blood, and the lips brought together as near as possible with adhesive plaster, covered over with a common bandage. The patient is then treated antiphlogistically. The wound is extremely small, and unites *per primam intensionem*. Bouvier, Günther, and others have performed the operation on dogs and horses; and their experiments prove that the divided tendon unites with a firm and strong band, much resembling cartilage in its structure.

The subsequent treatment consists in restoring the foot, by an apparatus of extension, to its normal form. Stromeyer's foot-board is the apparatus generally made use of. It must not be applied before cicatrization has taken place (which, in the average of cases, is on the fifth or sixth day after the division), otherwise suppuration will be the consequence; as is clearly demonstrated in the instance of Sartorius, mentioned above.

Numerous cases of lateral curvature of the spine, of which contraction of the dorsal muscles was the cause, have lately been effectually treated by Dr. Guerin in Paris, by dividing the muscles Trapezius, Sacrolumbalis, Longissimus and Spinalis dorsi. This able Physician has performed no less than 14 successful operations of Myotomy in cases of lateral distortion of the spine. The youngest patient was 13 years of age, the eldest 23. It would appear that immediately after the operation the deformity disappears. The most remarkable case was that of a patient, 23 years old, suffering under lateral curvature of the spine, who had derived no benefit from the orthopaedic apparatus, after eighteen months trial. As soon as Dr. Guerin divided the muscles, the spine was restored to its natural form [17]).

It is only within a few months that the celebrated Dr. Dieffenbach, of Berlin, for the first time performed the operations of Tenotomy and Myotomy in cases of Strabismus. He divides the

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17) See his letters to the Academy of the 24. June, 1839. (Gazette Medicale No. 26).

M. rectus internus oculi (sometimes *trochlearis*), in Strabismus convergens; and the *rectus superior* in Strabismus divergens. In no less than 90 cases he has succeeded in completely restoring the eye to its normal position. The youngest patient was five years of age, and the oldest forty. In one remarkable instance of Strabismus complicated with Blepharoptosis, the division of the muscles removed both complaints. The same success attended the operation in another instance in which Strabismus was connected with Nystagmus.

We have every reason to believe that the skill and ingenuity, which have been already so eminently successful in orthopaedic operations, will, as the science advances, be directed with equal effect to the removal of other deformities, which have hitherto baffled the efforts of the most able practitioners. Orthopaedia is at present in its infancy. When we consider, however, the rapid progress it has made during the short period in which its importance has been partially acknowledged; we may confidently expect that, when its principles become universally known, its future improvements will be upon a far more extensive scale. If

the general sketch of its elementary principles, given in the preceding pages, should in any degree contribute to awaken an interest in the subject among members of the profession whose attention has not previously been directed to it, a principal object the Writer had in view will have been accomplished.